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(71) Applicant(s)	(56) Documents Cited		
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	GB 1472685 A		
(72) Inventor(s)	(58) Field of Search		
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(54) Abstract Title
Quick hitch coupling device

(57) A quick hitch coupling device 20 for mounting attachments, such as buckets, to the arm of an excavator comprises a plate 39 provided with paired mounting brackets 21, 22 and side members 23, 24. The mounting brackets are provided with holes 25-28 for fixing the device 20 to an excavator arm and the side members are provided with hook-shaped openings 31-34. The plate 39 is further provided with an aperture 41 through which locking pin 43 extends and engages aperture 42 formed in cross member 40.

As best seen in figure 14, the locking pin 43' is provided with a head 44' with an aperture therein 60. In use the mounting pins of an attachment are engaged by the hooks 31-34 and locking pin 43' is placed in aperture 41'. The pin slides into position allowing peg 45 to extend through aperture 60. A clip 53 may then be placed through aperture 52 of peg 45 to prevent movement of locking pin 43'. The locking pin 43, 43' may have a circular or acircular shaft and an automatic retractable latching facility 55 may also be provided to latch headed pin 43' in place.

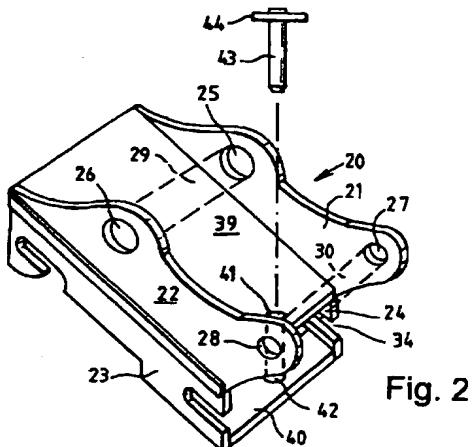
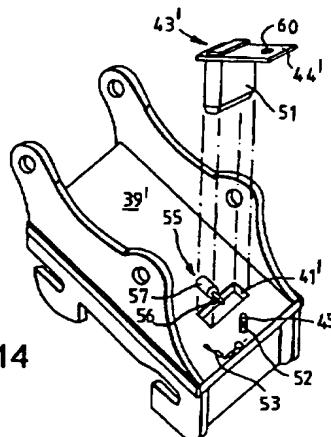


Fig. 14



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At least one drawing originally filed was informal and the print reproduced here is taken from a later filed formal copy.

Fig. 1

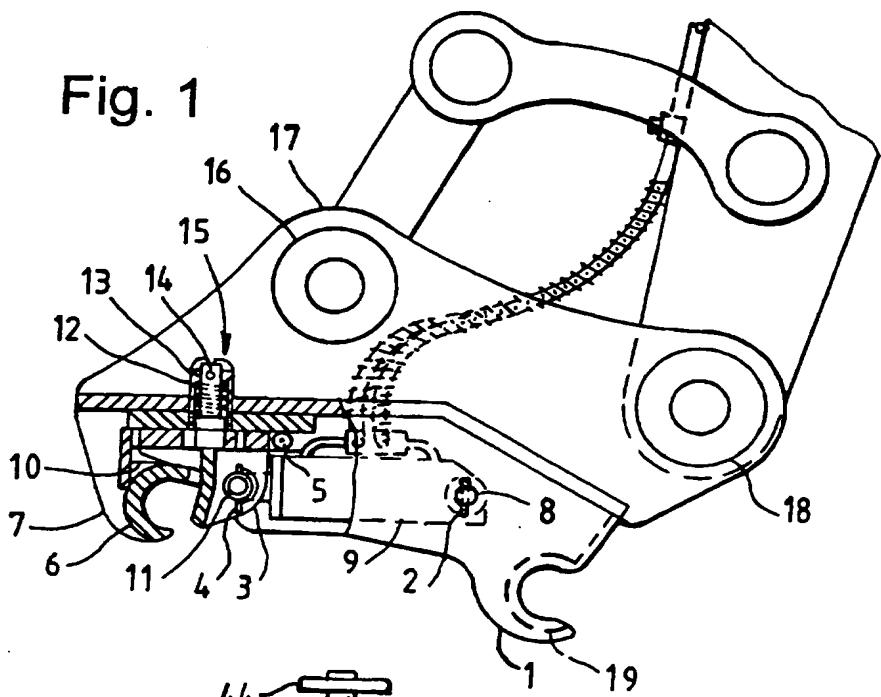
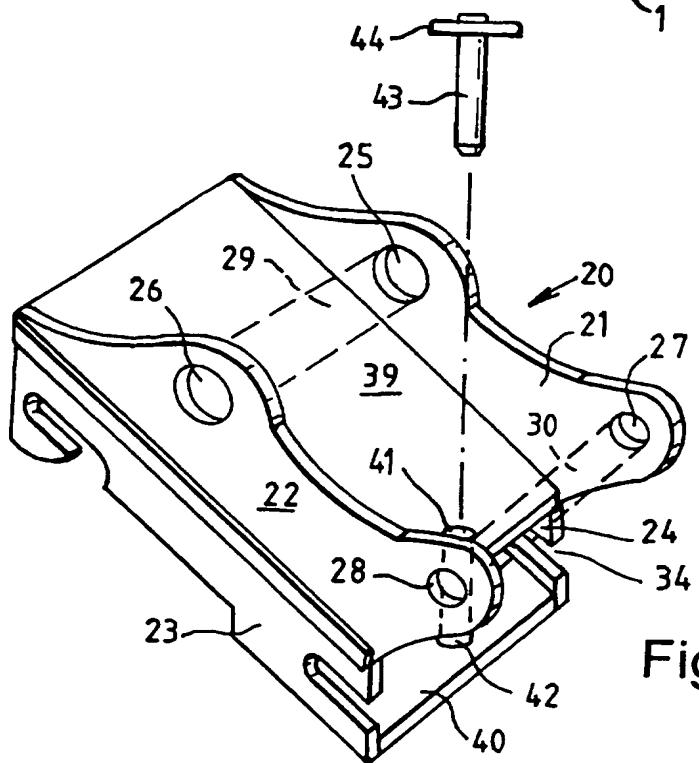


Fig. 2



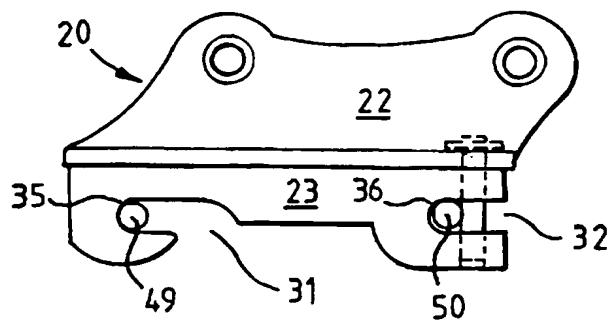


Fig. 3

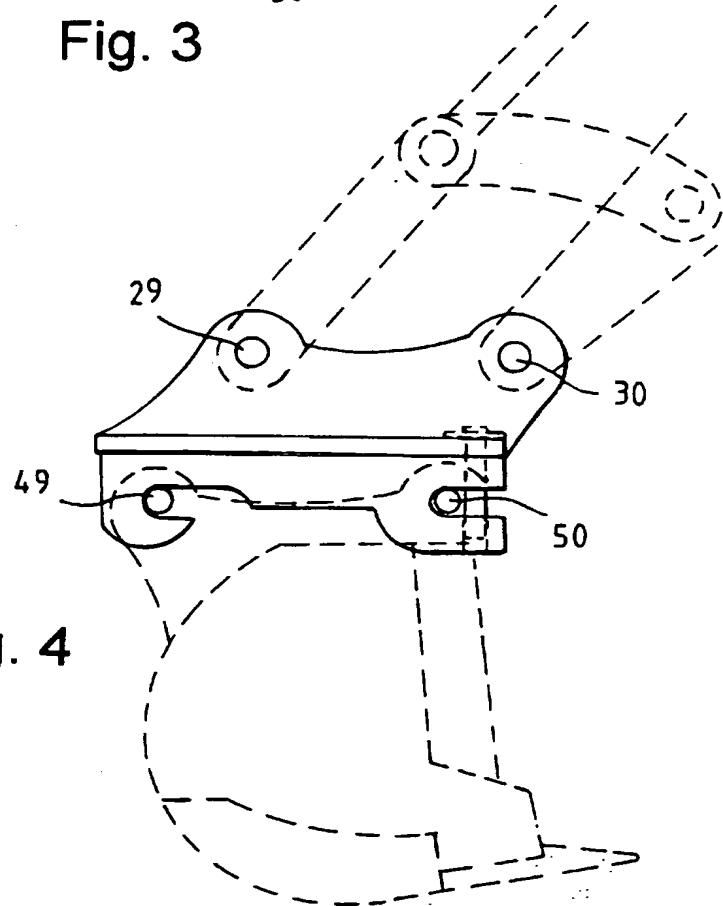


Fig. 4

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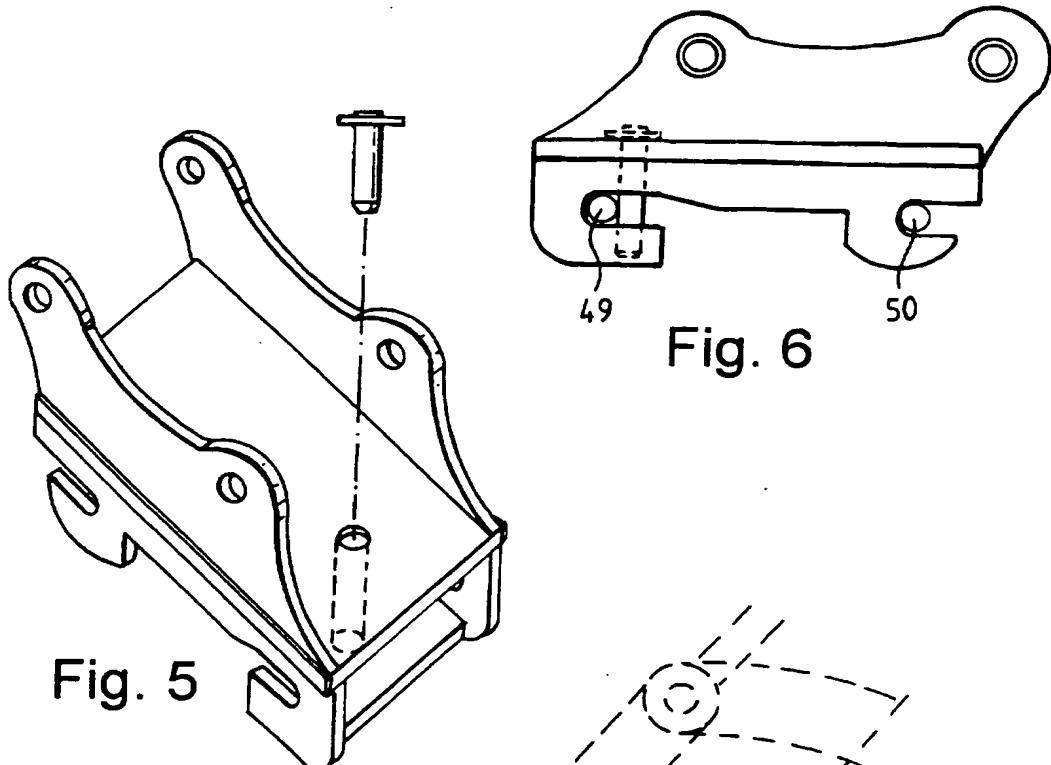


Fig. 6

Fig. 5

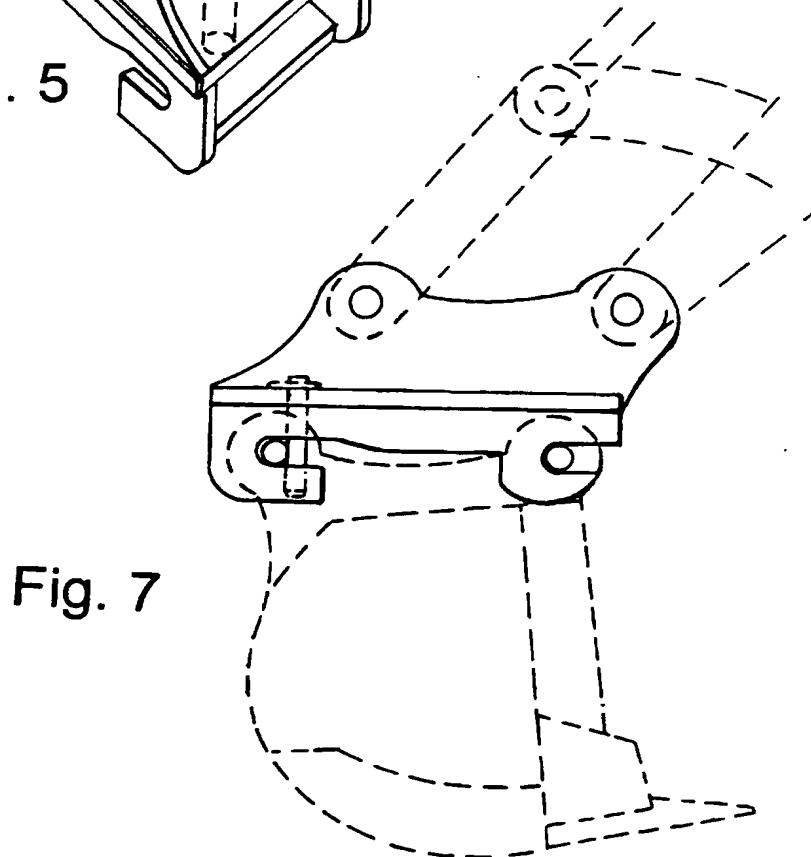


Fig. 7

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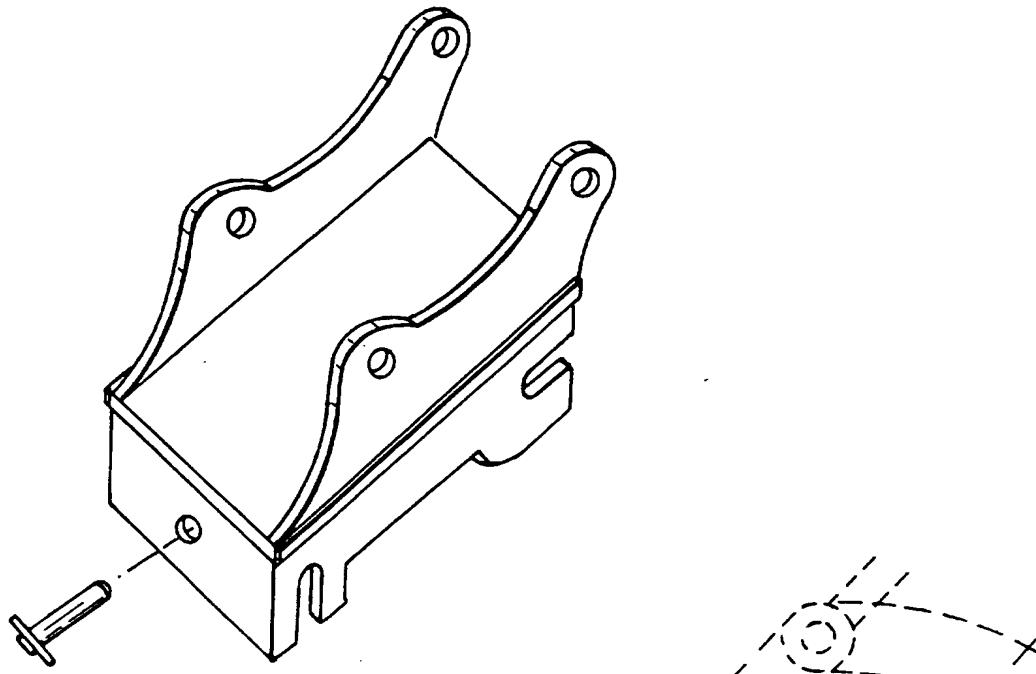


Fig. 8

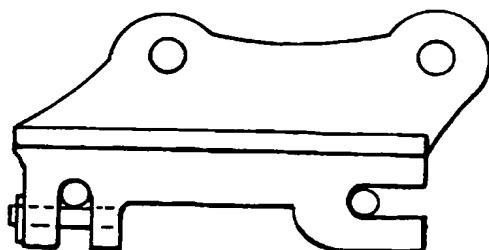


Fig. 9

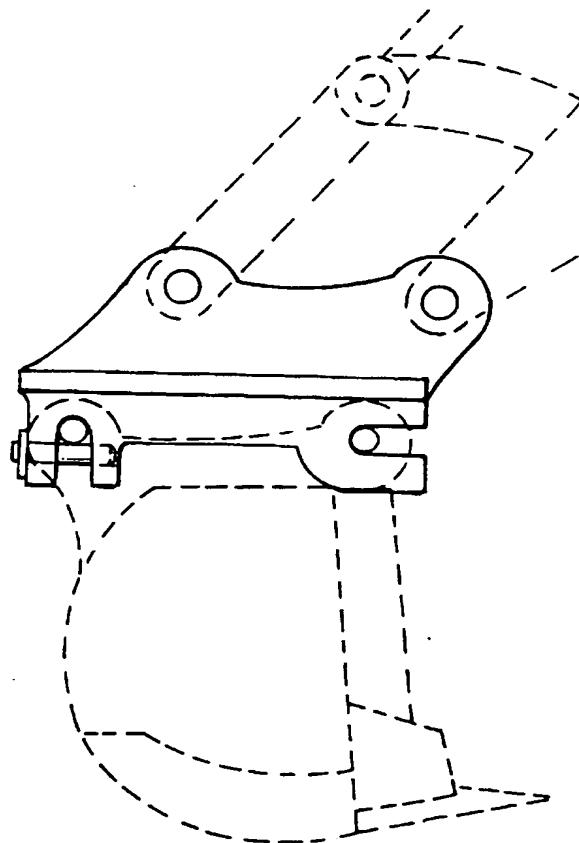


Fig. 10

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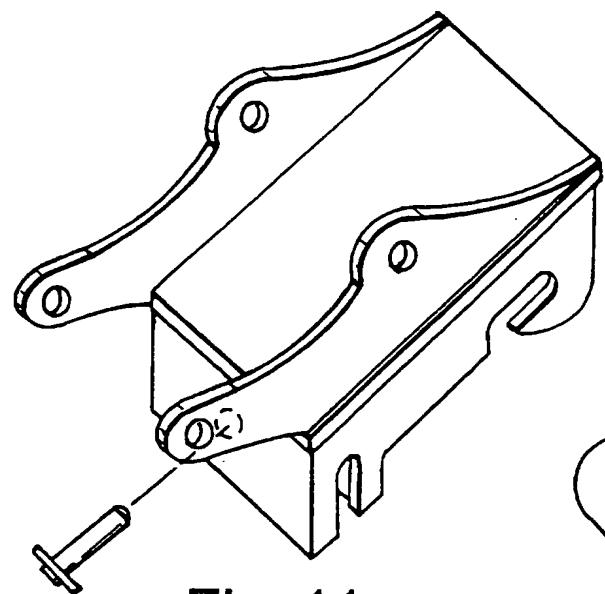


Fig. 11

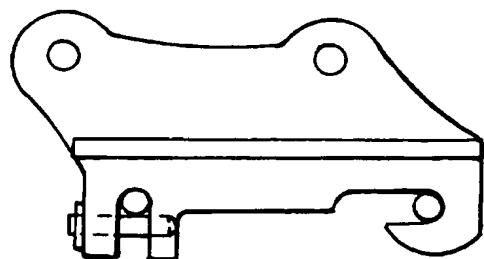


Fig. 12

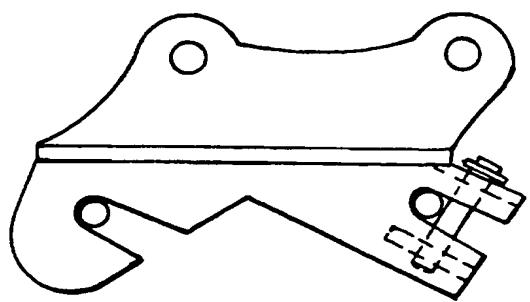


Fig. 13

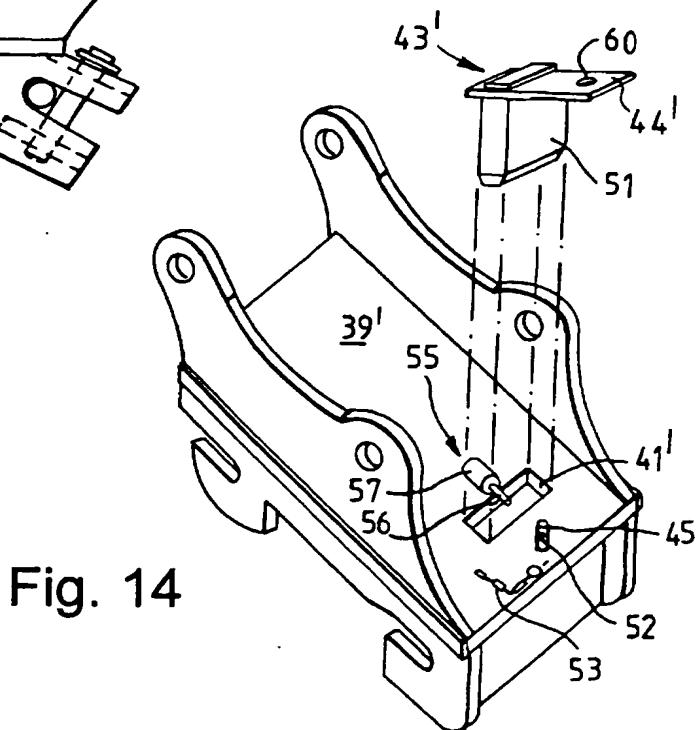


Fig. 14

IMPROVED QUICK HITCH COUPLING DEVICE

Field of the Invention

The present invention relates to an improved quick hitch coupling device. It is particularly applicable to a quick coupling device for connecting attachments, 5 including buckets, to the arm of an excavator.

Background to the Invention

Mechanical excavators are used extensively in the construction industry and their use is increasing as more and more attachments become available in addition to conventional buckets. Their versatility depends, in part, on the facility to swap 10 attachments on the end of the grab-arm quickly, easily and safely. Using a bucket as an example, in the original design the bucket is held in place by two high tensile pins. These pins, which in use are substantially parallel to each other, pass through circular holes in mounting brackets on top of the bucket and through corresponding holes in the assembly at the end of the excavator arm. The pins are held in place 15 so that they cannot move accidentally. This is typically achieved using a split pin arrangement. The pins in this set-up act both as pivot pins about which the bucket can be rotated and mounting points to secure the bucket to the arm.

Replacing a bucket with this type of coupling requires that the bucket is lowered onto a firm surface and the split pins removed. The mounting pins are then 20 driven out from both mounting brackets and excavator arm mountings to release the first bucket. The arm is then moved to line up with a second bucket. The pins are then driven back into place through the mounting brackets one at a time. It will be readily appreciated that this is an awkward and time consuming job and almost inevitably requires two people, one to work the excavator arm and the other to guide

the alignment and insert the pins. Having driven the pins into place, the split pins have to be re-inserted, assuming that they have not been lost in the meantime.

The awkward nature of this attachment exchange process has led to the development of various quick hitch couplings such as the Geith™ Quick Hitch. The 5 Quick Hitch is attached to the end of the excavator arm in place of the bucket and is held in place by pins in the same manner as described above. The Quick Hitch becomes, in effect, a semi-permanent fixture at the end of the arm and is interposed between the arm and the attachment.

Typically the hitching element of these Quick Hitches consists of four hooks 10 adapted to engage two pins fixed in place between the mounting brackets on the bucket/attachment. The hooks are arranged in two side-by-side pairs i.e. two front and two rear aligned such that the captive region of each hook is arranged to correspond with respective pin centres.

Two further operations are required to secure the bucket into place. First, 15 further fixing portions associated with at least two of the hooks are moved into a position in which two of the hooks substantially encircle one of the pins. This prevents the bucket from becoming detached in use. Secondly, some safety device is activated such that the fixing portions cannot withdraw accidentally. Release of a bucket accidentally during use could be extremely dangerous.

20 These further fixing portions of the hooks can be moved into place either hydraulically or by screw thread action.

Whilst these known Quick Hitches are certainly an improvement, they still suffer from certain disadvantages:-

(a) 25 they are relatively expensive to produce because they inevitably contain moving parts. The fixing portions must move freely from a position in which

- the mouth of the hook is open into a position in which a pin is held captive within the hook.
- (b) where hydraulic activation of the fixing portion is used, it is necessary to tap into or modify the hydraulic system on the excavator.
- 5 (c) if mechanical activation of the fixing portion is used, then this requires some tool, such as a socket wrench. If this tool goes missing, as is often the case on construction sites, then the Quick Hitch is inoperable until another tool can be found.
- (d) The inhospitable conditions under which these excavators are used tend to cause the movement of moving parts to be obstructed or at worst to jam.
- 10 It is the object of the present invention to overcome or at least mitigate some or all of the above problems.
- Summary of the Invention**
- According to a first aspect of the present invention, there is provided a quick
- 15 hitch coupling for mounting of attachments to the arm of an excavator comprising:-
- (i) means to attach the coupling to the arm of an excavator;
- (ii) hook means adapted to hook around pins on or attached to a bucket or other attachment;
- (iii) securing means adapted to prevent the pins exiting the hooks;
- 20 (iv) a safety mechanism adapted to prevent accidental release of the attachment;
- characterised in that the securing means comprises a headed locking pin.
- Preferably the head of the headed locking pin incorporates a first aperture adapted to fit, in use, over a peg, said peg incorporating a second aperture adapted
- 25 to accept a clip, this arrangement in combination forming a safety mechanism.

In a particularly preferred embodiment two headed locking pins are used in combination.

Description of the Drawings

- The invention will be further described, by way of example, with reference to the accompanying drawings in which:-
- 5 Figure 1 illustrates a prior art hydraulically locking quick hitch;
- Figures 2 and 3 illustrate perspective and side elevation respectively of a first embodiment of the present invention;
- 10 Figure 4 shows the first embodiment illustrated in Figures 2 and 3 with a bucket in place held in by a locking pin;
- Figures 5 and 6 illustrate perspective and side elevations respectively of a second embodiment of the present invention;
- 15 Figure 7 shows the second embodiment illustrated in Figures 5 and 6 with a bucket in place held in by a locking pin;
- Figures 8 and 9 illustrate perspective and side elevation views respectively of a third embodiment of the present invention;
- 20 Figure 10 shows the third embodiment illustrated in Figures 8 and 9 with a bucket in place held in by a locking pin;
- Figures 11 and 12 illustrate a fourth embodiment of the present invention;
- Figure 13 illustrates a side elevation of a fifth embodiment of the present invention.
- Figure 14 is a view similar to that of Figure 5 but of a further embodiment of the present invention having a rectangular/cuboidal locking pin, a latch mechanism and a safety mechanism comprising a split pin.

Description of Preferred Embodiments

Embodiments of the present invention are described below by way of example only. These examples represent the best ways of putting the invention into practice that are currently known to the Applicant although they are not the only 5 ways in which this could be achieved.

Referring to Figures 2 and 3, these illustrate a quick hitch coupling 20. The coupling includes a plate 39 with paired mounting brackets 21 and 22 and side members 23 and 24 extending therefrom. The mounting brackets 21, 22 have circular apertures 25 - 28 inclusive which are adapted to accept pins 29, 30 which in 10 use attach the mounting brackets to an excavator arm. This attached arrangement is shown more clearly in Figure 4.

The dependent side members 23, 24 have formed in them hook-shaped openings 31, 32, 33 and 34 which are dimensioned such that the inner or captive portions of the hooks 35, 36, 37 and 38 are spaced such that they align with the 15 respective pin centres of pins 49 and 50, provided on the bucket attachment. Hook 33 and its associated captive region 38 are not visible in Figures 2 and 3 because they are concealed by the body of the coupling. Hook 33 is located opposite hook 31 and both 31 and 33 engage around the same pin 49.

Thus far, the arrangement is similar to earlier quick hitches. However, in the 20 present invention the method of retaining the pins on any attachment captive within the hooks is entirely different. A cross-member 40 extends between the opposite side members 23, 24 in the region of at least two of the hooks. In the example illustrated in Figures 2 and 3 the cross-member is located such that it is situated in use towards the forward edge of the bucket. Apertures 41 and 42 are formed 25 respectively through the plate 39 and cross member 40 and are adapted to accept a

headed fixing pin 43. The fixing pin, once located, retains both attachment pins captive within the hooks. This captive arrangement is illustrated in Figure 4.

All that remains is to apply some safety mechanism to prevent the fixing pin 43 inadvertently jumping out of its mounting holes. Many types of safety mechanism can be used. For example, with reference to Figure 14 the head 44' of pin 43' could contain an aperture which is adapted to fit over a peg 45 upstanding from the plate 39. The upper part of the peg 45 extends through a hole 60 in the pin head 44 and includes a small hole 52 to accept a split or "R" pin 53 which can be attached to the peg or head by a chain or wire 54 to prevent it getting mislaid.

To facilitate locating the pin head 44' over the peg 45 the shaft 51 of the pin and the attendant holes 41, 42 are shaped such that the pin will only fit into the openings in one orientation. In Figure 14 the shaft 51 and holes 41, 42 are rectangular. This, furthermore, greatly strengthens the pin, in use.

It will be appreciated that no tools, other than possibly a pair of pliers, are needed to change the attachment when using this new quick coupling device. This represents a real advantage over previous manual quick hitches.

As explained above, a wide variety of safety mechanisms are possible and the above version is described by way of example only. An "R" clip could be fitted through the end of the pin 43 furthest from the head, for instance. In practice, any mechanism which traps the locking pin 43 in place and which requires a positive action by the operator to release it may suffice.

In the Figure 14 embodiment an automatic retractable latching facility 55 is provided to latch the headed pin 43' in place. This comprises a latch bolt 56 slidably mounted in a housing 57 on the upper face of the plate 39' and spring loaded to

project over the aperture 41' and latch over the top of the pin head 44' or, less preferably, latch into a keep recess in the shaft 51 of the pin 43'.

- It will be appreciated that the orientation of the hook-shaped openings 31 - 34 inclusive in the side members can be varied, as can the location of the locking pin 43 and associated latch facility 55 and securing peg 45. Figures 5 - 13 inclusive show just some of these variations but omitting the latch 55 and peg 45. However, the important features common to all these variations are a series of hook-shaped openings which are positioned such that the inner portions of the hooks align with the respective attachment pin centres, and at least one locking pin.
- 10 The exact orientation of the holes is not critical in terms of the invention, but may influence the overall strength of the finished product.

- It is perfectly possible and sometimes desirable to have more than one locking pin to retain the attachment in place. This provides increased strength and increased safety in the event of one pin breaking or working loose. Two or more locking pins may therefore be associated in a side-by-side fashion with one of the pins on the attachment or may be located one behind another associated with different attachment pins.

- The materials and method of construction of this invention may be decided by the materials specialist. Generally, the coupling can be manufactured from hardened steel or steel alloy and the apertures 25 - 28 may be bushed with hardened steel alloy bushes to reduce wear.

The only movable or removable part is the locking pin 43 and any attendant safety clip. These are very cheap to produce and replace and operators can be issued with spares as a matter of course. In this way, even in the event of

mechanical failure or loss, the quick hitch coupling can be readily brought back into operation.

CLAIMS

1. A quick hitch coupling for mounting of attachments to the arm of an excavator, comprising:
 - (i) a coupling body having means to attach the coupling to the arm of an excavator;
- 10 (ii) hook means on the coupling body adapted to hook around mounting pins of a bucket or other attachment;
- 15 (iii) securing means adapted to prevent the attachment's mounting pins exiting the hook means in use;
 - (iv) a safety mechanism adapted to prevent accidental release of the attachment, in use; characterised in that the securing means comprises a headed locking pin.
- 20 2. A quick hitch coupling as claimed in claim 1, wherein the coupling body has an aperture to receive the headed locking pin extending therethrough to bar exiting of the attachment's mounting pins from the hook means in use.
- 25 3. A quick hitch coupling as claimed in claim 2, wherein the coupling body further has a second aperture substantially plane parallel to and aligned with the said aperture, whereby the headed locking pin extends through said aperture and

said second aperture in use to prevent the attachment's mounting pins exiting the hooks.

4. A quick hitch coupling as claimed in claim 3, wherein said first aperture is formed in a first cross member which bridges between each member of a pair of paired said hook means and said second aperture is formed in a second cross member substantially plane parallel to the first cross member and which bridges between each member of said pair of paired hook means.

10 5. A quick hitch coupling as claimed in any preceding claim, wherein the headed locking pin has an acircular shaft.

6. A quick hitch coupling as claimed in any preceding claim, wherein the ~~coupling further comprises a retractable spring-loaded latch means on the coupling~~
15 body to latchingly engage with the locking pin in use.

7. A quick hitch coupling as claimed in any preceding claim, wherein the safety mechanism comprises a peg provided on the coupling body, the headed locking pin having an aperture in the head thereof to fit over the peg when the headed locking 20 pin is mounted to the coupling body, the peg having an aperture therethrough to accept a clip to clip the head of the headed locking pin in place on the peg.

8. A quick hitch coupling substantially as hereinbefore described with reference to any suitable combination of the accompanying drawings.



The
Patent
Office
II

Application No: GB 9807631.8
Claims searched: 1 - 8

Examiner: Dr Chris Moore
Date of search: 1 July 1998

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.P): B8H (HEA, HCA, H16T, HSA, HPC)

Int Cl (Ed.6): E02F 3/22, 3/36, 3/96, 9/14.

Other: Online : WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2259293 A	(EDELEANU) see fig 1, hook 3, locking pins 9, safety mechanism 14, pages 3 & 4.	1,2,5
X	GB 2239445 A	(HODGES) see figs 11 & 12, hook 13, locking pin 25, page 3 line 9-15.	1,2
X	GB 1472685 A	(WAIN-ROY) see fig 3, locking pin 44, page 4 line 20 - 22.	1-3
X	GB 1492504 A	(HARVESTER) see figs 1 & 7, locking pin 84, safety mechanism 100.	1,2

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art.
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.